FILE CODE 135-A-5

# TECHNICAL
# INSPECTION PROCEDURES

## FOREIGN
## MATERIAL

CANNED AND FROZEN BERRIES
AND RELATED PRODUCTS

FOR USE OF USDA PROCESSED PRODUCTS INSPECTORS

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Fruit and Vegetable Division
Processed Products Standardization and Inspection Branch

# SECTION I

## GENERAL

In certifying the grade of a product, it is necessary to perform such analyses as will establish the wholesomeness of that product. In the case of canned and frozen berries and related products, it is necessary to check the finished product for mold, light filth, heavy filth, maggots, and any other type of objectionable material that may be present.

Types of determinations required and the methods and procedures followed will vary somewhat from product to product. Irrespective of the details outlined in this instruction, inspectors are cautioned to be alert at all times in sampling and grading products for any unusual conditions or foreign material and exercise good judgment in evaluating the quality of the product.

The methods and procedures outlined herein are sufficiently comprehensive to cover most situations encountered during normal, routine inspections. The term "light filth" refers to materials such as insects, insect fragments, and rodent hairs that are recovered in the upper layer, or kerosene fraction of the Wildman trap flask. The term "heavy filth" refers to material that normally sinks in water (for example, sand, dirt, and small pebbles) and can be recovered by sedimentation procedures. Maggots comprise a separate category of heavy filth and are also recovered by a sedimentation procedure.

The specific analyses required for individual products and the number of analyses required are outlined in 172-A-1.

SECTION II

MICROSCOPIC EXAMINATION

I Mold

A. Care and Operation of Pulper

The cyclone pulping machine should be washed and cleaned after running each sample. This is most readily accomplished by dismantling and removing parts to a sink for washing. Assemble the cyclone as follows:

1. Slide cylinder with hopper on motor and tighten set screw.

2. Place threaded end of screw shaft through opening in end of cylindrical sieve and twist on knurled screw.

3. Grasp screw assembly by knurled screw and slide into cylinder until slotted shaft fits into motor coupling.

4. Tighten set screws.

5. Be sure the screen fits snugly in the recessed areas within the cylinder at both ends to prevent leakage of fibrous matter and seeds into the pulped material. If a tight fit is not possible, have the cylinder wall machined down until a close seal is accomplished.

B. Preparation of Sample

In following the subs to analyze, choose the samples that are most suspicious looking or which have the appearance of containing decay.

1. Sample Size

Retail size containers - use the entire container.

Bulk containers - use an approximate 2-pound core or a 2-pound representative portion of the subsample.

2. Draining Berries

a. Canned or frozen strawberries, blueberries, blackberries, raspberries, and other drupelet berries with water or syrup packing media.

Drain these products two minutes on a No. 20 sieve and pulp the drained material only. Discard the packing media.

b. Frozen strawberries, blackberries, raspberries, and other drupelet berries with dry sugar or no packing media.

Pulp these products as they are. Do not drain.

3. Pulping

a. Be sure the outlet tube is pointing upwards and is plugged with a No. 0 or No. 1 stopper.

b. Add the berries or fruit and juice to the cyclone hopper.

c. Pulp the entire subsample and collect the material emerging from the cyclone in a large evaporating type dish or similar receptacle.

d. Dismantle the pulper and scape any material adhering to the outside of the screen, adding it to the sample in the dish.

e. Mix the pulped material well.

f. Check the appearance of the residue inside the cylindrical screen. It should be quite dry and consist mainly of seedy and fibrous material.

g. The use of 30-mesh sieves in lieu of mechanical pulpers should definitely be discouraged since it is a time consuming operation and administrative guides are based on the use of a cyclone.

4. Deaeration

Transfer approximately 100 grams of the well mixed pulped material to a beaker. Add about 15 drops (1/2 ml.) of caprylic alcohol and stir the mixture carefully to dissipate air bubbles.

NOTE: The caprylic alcohol may be added to the entire sample in the evaporating dish and the entire sample deaerated if so desired.

In the case of fruit preserves, an optional method may be used as follows:

Place approximately 100 grams of the well mixed sample in 400 to 600 ml. size beaker and boil vigorously for about 1 minute. Stir the sample while cooling. Do not place hot material on Howard mold count cell as it may crack the glass.

5. Dilution with Stabilizer

Any one of the following three stabilizers may be used:

a. 0.5 percent Na Carboxymethylcellulose*; 3-5 percent pectin solution; 1 percent algin solution. As a preservative formaldehyde may be added (2 ml. per 100 ml. stabilizer) or Sorbic Acid (.02 to .05 grams per 100 ml. stabilizer).

* Cellulose gum (CMC-7HSP, Hercules Powder Company, 910 Market Street, Wilmington, Delaware.

b. Do not add stabilizer to the following products;

Strawberries
Light Colored Fruit Preserves
Fruit Butters

c. Count the following products after first diluting 100 grams of the pulped sample with 100 grams of stabilizer:

(1) Light Colored Cane Berries

(2) Cranberry Sauce

Immerse unopened can in boiling water 30-45 minutes. Open can carefully and transfer contents to beaker and stir to break the gel. Slow speed electric mixer may be used (350-450 rpm). Add stabilizer as specified.

d. Count the following products after first diluting 100 grams of the pulped sample with 200 grams of stabilizer:

Dark Colored Cane Berries
Dark Colored Fruit Preserves

C. Howard Mold Count

Proceed as outlined in File Code 135-A-8, Mold Count.

## II Insects and Light Filth

### A. General

Cane berries (raspberries, blackberries, Loganberries, boysenberries, etc.), are subject to various types of infestation, including thrip, ants, stink bugs, mites, larvae of various types, orange tortrix and the raspberry worm. Some types of infestation are of such size and character as to be readily observed by visual examination of the product. However, infestations such as thrip are too small to be readily identified and enumerated by microscopic (visual) examination or the insects may be imbedded in the drupelets of the berry. Consequently, the same must be extracted and examined by microanalytical methods in order to obtain an estimate of the amount and nature of light filth present.

### B. Procedure

1. Materials:

   a. Wildman trap flask (2000 ml.) and plunger

   b. 50 and 100 ml. measuring graduates

   c. Buchner funnel (8 cm inside diameter)

   d. Filtering flask, heavy walled

   e. Filter pump or vacuum pump

   f. Filter paper, 9 cm diameter

   g. Wide-field microscope

   h. Gram scale

2. Reagents:

   a. Kerosene, Refined kerosene, if available

   b. Lead acetate solution

      To prepare one liter, dissolve 350 grams Lead Acetate in approximately 850 ml. H(2)0 by boiling. Add Glacial Acetate Acid slowly until mixture becomes clear and stays clear; then add 5 additional ml. Glacial Acetic Acid and dilute with water to the one liter mark.

c. Deaerated water

3. Preparation of Sample

FROZEN: Take 200 grams of the product (berries and packing media), add 200 grams of water and 20 ml. of lead acetate solution. Boil 30 minutes in a 1000 ml. beaker.

CANNED: Take 200 grams of a proportionate amount of berries and packing medium, add 20 ml. of lead acetate solution. Boil 10 minutes in a 1000 ml. beaker.

While cooking, add additional water as necessary to maintain this approximate level. Be sure to crush all berries thoroughly so that drupelets are separated from the center core; otherwise, insect recovery will be incomplete. Cool to room temperature.

Example: To obtain a proportionate amount of berries and packing medium, the following example is given:

| | |
|---|---|
| Net weight of sample | - 106 ozs. |
| Drained weight of sample | - 70 ozs. |
| Required weight of material | - 200 grams |

Berry Ingredient - $\frac{\text{dr. wt. (oz)}}{\text{net wt. (oz)}}$ X (200)

- $\frac{70}{106}$ X (200

= 132.7 grams

Therefore, a 200 gram proportionate sub will require 133 grams of berries and 67 grams of packing medium.

4. Extraction of Prepared Sample

a. Transfer prepared berry material to 2000 ml. Erlenmeyer flask.

b. Add 35 ml. kerosene and mix with plunger 2 to 3 minutes in such a manner as to avoid inclusion of air bubbles. This can be accomplished by tilting flask at an approximate 45 degree angle and moving the plunger back and forth through the mixture without churning the mixture by violet agitation.

c. Add sufficient deaerated water to bring solution level up to neck of flask.

d. Let stand 30 minutes without further stirring.

e. Trap off kerosene fraction and transfer to 250 ml. beaker, washing neck of flask into beaker.

f. Return the flask to the upright position. Work plunger disc loose and lower into the flask.

g. Add 20 ml. of kerosene and re-extract as above. Let stand 10 minutes, decant again in the same beaker, washing the neck of the flask in the beaker.

h. Stir vigorously approximately 30 seconds and allow to stand 10 minutes with an occasional gentle stir.

i. Then trap off any additional kerosene which may have risen and transfer to the same 250 ml. beaker, washing neck of flask thoroughly.

j. Filter the contents of the beaker.

k. Examine under a 20 percent wide field microscope using a good light source.

l. Enumerate number and type of insects or insect fragments found on paper.

C. Comments on Technique

1. Do not rush the process. All of the steps are at the minimum which will give best results.

2. As a general rule, small drupelet berries, such as loganberries, can take a few minutes less boiling time than large drupelet berries, such as boysenberries. It is unwise to try to reduce boiling time since this is the step that releases the insects from the berry into the water. Also, poor separation results if the berries are not adequately boiled.

3. An important step in the procedure is the method of adding water to the flask. If the siphon tube is allowed to run above the surface of the sample, or down the plunger rod, air bubbles will be incorporated into the sample, causing too much berry material to rise to the surface which will later be trapped off with the fraction for filtering.

4. Another important step in the procedure is the agitation of the berries and water with the kerosene. If the oil is thrashed into an emulsion, the effectiveness of the extraction is reduced because the emulsified oil with entrapped air raises considerable debris, prevents a good separation of oil and water and materially increases the time and effort required for subsequent filtering and searching of the filter paper.

5. In trapping off the kerosene fraction the plunger may be rotated slightly to produce a "swishing" action and clear and berry debris that may be floating at the interface of water and kerosene layers. This "swishing" technique may take a bit of practice. The object is to remove any noticeable concentration of berry pieces that re floating on top of the water next to the kerosene. This method does not completely remove all the berry particles from the oil; that is, there may be some small amount of vegetative matter on the filter paper but not sufficient to hamper the actual location and identification of specimens. It is advisable to use a teasing needle to probe any large pieces of berry drupelet that may be on the filter paper.

It is necessary to use a teasing needle to probe any material on the filter paper for positive identification. Nymph thrips are practically transparent, with the exception of the eyes, which may be red. Positive identification of this insect is made by close examination (higher magnification may be required).

D. Recovery Results

The results of this examination should be recorded on the score sheet in such a manner as to accurately summarize the findings. Large insects, worms, and larvae (generally over 2 - 3 mm.) should be recorded by number and approximate size or length per sample of a specified size. Smaller specimens recovered by the microanalytical examination are reported by type and number per 200 gram sample. For example, a sample of 6-10-ounce cartons of frozen raspberries is being inspected. As the product is being evaluated for scoring, the following notations indicate infestation observed microscopically:

| | | |
|---|---|---|
| 1 carton | - | 1 larva 8 mm. long |
| 1 carton | - | 1 larva 5 mm. long |
| | - | 1 ant |
| 1 carton | - | 3 stink bugs ea. 2 mm. long; (the term "ca." means about or approximately). |

The microanalytical examination shows the following per 200 gram subsample:

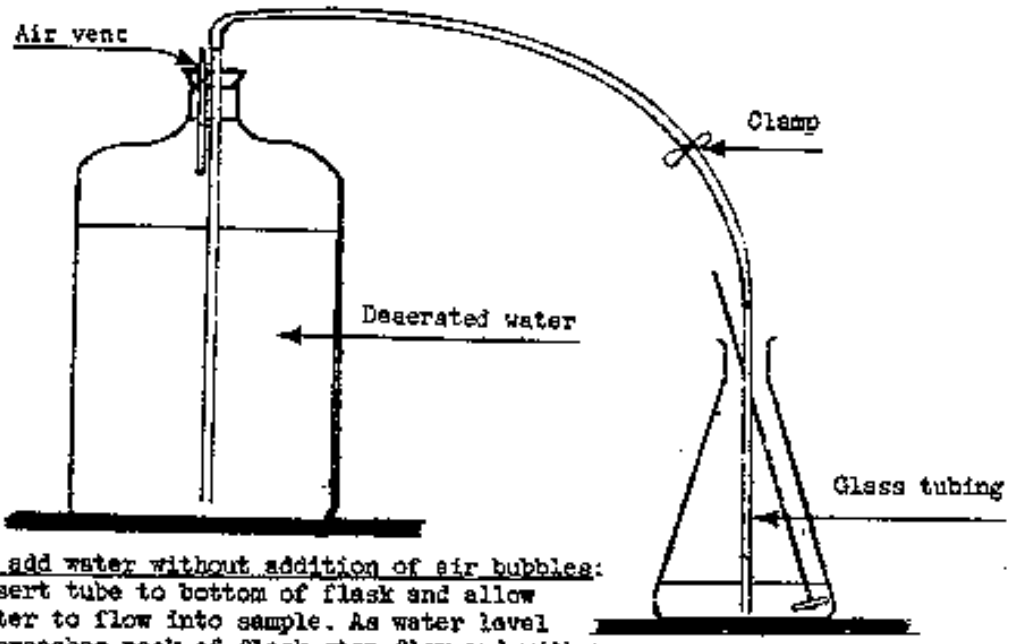
1 larva ca. 2 mm. long
42 thrips
3 mites
11 insect casts
1 rodent type hair ca. 7 mm. long

* Refer to File Code 172-A-1, Section 3 for limits on infestation.

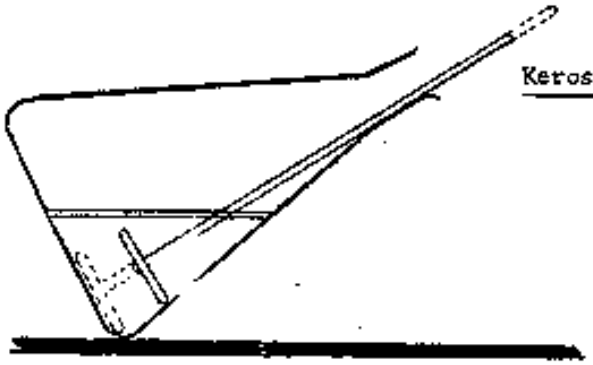
E. Evaluating the Results of Inspection

Macroscopic examination of representative sample units provides the technician with a good overall picture of the lot with respect to foreign material that can be seen by visual examination.

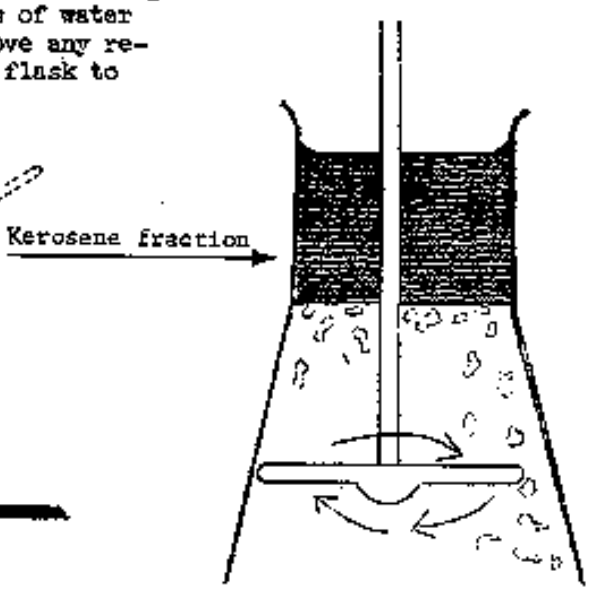
Microscopic examination is necessarily restricted to a limited size sample but gives a detailed enumeration of number and type of insects that are not easily seen or recovered without extraction and microscopic examination. Through careful examination of the product, using the methods and procedures outlined in this instruction and by recording the results of the tests properly, the acceptability of the lot can be determined with a reasonable degree of reliability.




To add water without addition of air bubbles: Insert tube to bottom of flask and allow water to flow into sample. As water level approaches neck of flask, stop flow and withdraw tube. Wash sides of tube into flask using water. Allow a few additional drops of water to flow thru tube in order to remove any remaining oil. Bring water level in flask to trapping position.



To mix kerosene with sample: Using short strokes, thoroughly mix kerosene with sample. Avoid a "churning" or "threshing" action that will emulsify the mixture or incorporate air with the sample.




To eliminate excess extraneous matter in trapping off kerosene fraction: Gradually raise plunger to neck of flask and as rubber stopper on plunger approaches kerosene fraction, carefully rotate plunger to obtain a circular "swishing" action that will clear debris without agitating layer of kerosene.

SECTION III

MACROSCOPIC EXAMINATION

I General

Macroscopic examination refers to a visual examination of the product without the aid of a microscope. It includes certain sedimentation procedures, such as maggot recovery in blueberries and cherries and also flotation procedures without the use of a Wildman trap flask. There are distinct and real advantages in utilizing macroscopic procedures. A large quantity of product can be examined in a relatively short time. Also, the larger, more objectionable types of foreign material can be readily seen and evaluated in relation to the entire sample. Various techniques are employed in macroscopic procedures, such as use of water flotation, light box, etc.

II Procedure

Products, such as cane berries, can be mashed by hand and submerged in water in a deep enameled tray. With the addition of a little mineral oil stirred into the solution, light filth will separate out on top of the water in the oil layer where it can be easily seen and counted. This is a rapid method which can be run on many samples as a guide to the overall infestation throughout the lot. This procedure will supplement (but is not to replace) the Wildman trap flask procedure as outlined in this instruction.

Maggots are checked in blueberries and cherries according to the following procedures:

A. If frozen select a representative 20-ounce sample, add approximately 100 ml. of water, and boil 5 minutes.

B. If canned use the equivalent of a No. 2 can size (20 oz.).

C. Transfer aliquot as prepared in (1) or (2) above to a No. 6 sieve immersed in a pan of water.

D. Mash fruit carefully under water, rubbing the material through sieve.

E. Rinse and discard any pulp and seeds.

F. Repeat process with another portion of fruit.



G. After all fruit has been screened, transfer water, pulp and maggots to a black-

bottomed pan.

H. Slowly decant water and pulp from pan.

I. Add more water and repeat decantation.

J. Maggots will be evident on bottom of black pan. Generally, it is desirable to swirl the water. Maggots and heavy material will collect near the center of the pan.

K. Record number and size of any maggots recovered.

For products such a fruit butters, preserves (jams) and cranberry sauce, macroscopic examinations are to be made with the aid of a light box. This piece of equipment should be available in every area where these products are graded. Plants can make a suitable light box by simply putting a piece of frosted glass (approximately 12 by 12 inches) on top of a wooden box and installing a strong light in the box. The product should be spread evenly on the glass in a layer thin enough that the light will readily penetrate the product and permit the technician to observe any foreign material in the product.

Some berries, chiefly strawberries, are especially susceptible to embedded sand and grit and occasionally may contain rather large pebbles or mud balls. This can be attributed, in part, to inadequate washing procedures and in some instances, to abnormal contours of the berries, i.e., "monkey faces," etc. If there is a suspicion of larva, the tips should be cut and the berries examined for their presence.

Industry complaints regarding frozen strawberries in bulk containers indicate occasional lots have been found in which objectionable amounts of sand and grit and pebbles have been found at the bottom of the containers.

The inspector should be alert during all phases of the inspection for material of this nature. When the berries are washed for light filth, the bottom of the pan should be examined for heavy material.

Normally, sand and grit would be noted in organoleptic checks for flavor, but this method cannot be relied upon because of its limitations in sample size.